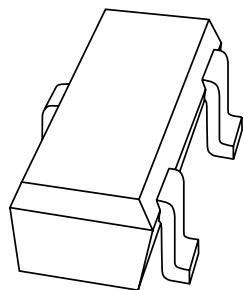


# DATA SHEET



## **PZM-N series** Voltage regulator diodes

Product specification  
Supersedes data of 1997 Dec 15

1999 Jan 28

## Voltage regulator diodes

## PZM-N series

## FEATURES

- Total power dissipation:  
max. 300 mW
- Small plastic package suitable for surface mounted design
- Wide working voltage range:  
nom. 2.4 to 75 V (E24 range).

## PINNING

| PIN | DESCRIPTION   |
|-----|---------------|
| 1   | anode         |
| 2   | not connected |
| 3   | cathode       |

## APPLICATIONS

- General regulation functions.

## DESCRIPTION

Low power general purpose voltage regulator diode in a SOT346 (SC59) plastic package, suitable for surface mounted design.

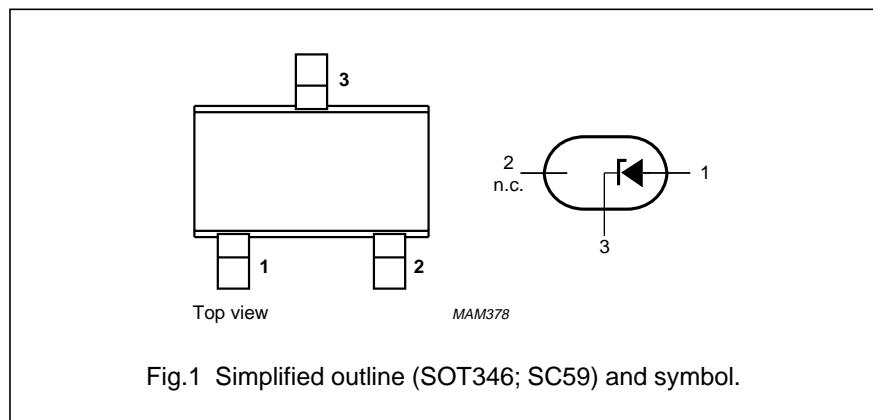


Fig.1 Simplified outline (SOT346; SC59) and symbol.

## MARKING

| TYPE NUMBER | MARKING CODE |     |     |     | TYPE NUMBER | MARKING CODE |     |     |     |
|-------------|--------------|-----|-----|-----|-------------|--------------|-----|-----|-----|
|             | B            | B1  | B2  | B3  |             | B            | B1  | B2  | B3  |
| PZM2.4N     | 2V4          | –   | –   | –   | PZM15N      | 15V          | 151 | 152 | 153 |
| PZM2.7N     | 2V7          | 271 | 272 | –   | PZM16N      | 16V          | 161 | 162 | 163 |
| PZM3.0N     | 3V0          | 301 | 302 | –   | PZM18N      | 18V          | 181 | 182 | 183 |
| PZM3.3N     | 3V3          | 331 | 332 | –   | PZM20N      | 20V          | 201 | 202 | 203 |
| PZM3.6N     | 3V6          | 361 | 362 | –   | PZM22N      | 22V          | 221 | 222 | 223 |
| PZM3.9N     | 3V9          | 391 | 392 | –   | PZM24N      | 24V          | 241 | 242 | 243 |
| PZM4.3N     | 4V3          | 431 | 432 | 433 | PZM27N      | 27V          | –   | –   | –   |
| PZM4.7N     | 4V7          | 471 | 472 | 473 | PZM30N      | 30V          | –   | –   | –   |
| PZM5.1N     | 5V1          | 511 | 512 | 513 | PZM33N      | 33V          | –   | –   | –   |
| PZM5.6N     | 5V6          | 561 | 562 | 563 | PZM36N      | 36V          | –   | –   | –   |
| PZM6.2N     | 6V2          | 621 | 622 | 623 | PZM39N      | 39V          | –   | –   | –   |
| PZM6.8N     | 6V8          | 681 | 682 | 683 | PZM43N      | 43V          | –   | –   | –   |
| PZM7.5N     | 7V5          | 751 | 752 | 753 | PZM47N      | 47V          | –   | –   | –   |
| PZM8.2N     | 8V2          | 821 | 822 | 823 | PZM51N      | 51V          | –   | –   | –   |
| PZM9.1N     | 9V1          | 911 | 912 | 913 | PZM56N      | 56V          | –   | –   | –   |
| PZM10N      | 10V          | 101 | 102 | 103 | PZM62N      | 62V          | –   | –   | –   |
| PZM11N      | 11V          | 111 | 112 | 113 | PZM68N      | 68V          | –   | –   | –   |
| PZM12N      | 12V          | 121 | 122 | 123 | PZM75N      | 75V          | –   | –   | –   |
| PZM13N      | 13V          | 131 | 132 | 133 | –           | –            | –   | –   | –   |

## Voltage regulator diodes

## PZM-N series

## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL    | PARAMETER                      | CONDITIONS  | MIN. | MAX.               | UNIT |
|-----------|--------------------------------|---|------|--------------------|------|
| $I_F$     | continuous forward current     |   | –    | 250                | mA   |
| $I_{ZSM}$ | non-repetitive peak current    | $t_p = 100 \mu s$ ; square wave;<br>$T_{amb} = 25^\circ C$ prior to surge |      | see Tables 1 and 2 |      |
| $P_{tot}$ | total power dissipation        | $T_{amb} = 25^\circ C$  | –    | 300                | mW   |
| $T_{stg}$ | storage temperature            |   | –65  | +150               | °C   |
| $T_j$     | operating junction temperature |   | –    | 150                | °C   |

## THERMAL CHARACTERISTICS

| SYMBOL       | PARAMETER   | CONDITIONS         | VALUE | UNIT |
|--------------|---|--------------------|-------|------|
| $R_{th j-s}$ | thermal resistance from junction to soldering point | $T_s = 60^\circ C$ | 300   | K/W  |

## ELECTRICAL CHARACTERISTICS

 $T_j = 25^\circ C$  unless otherwise specified.

| SYMBOL | PARAMETER       | CONDITIONS                         | MAX. | UNIT          |
|--------|-----------------|------------------------------------|------|---------------|
| $V_F$  | forward voltage | $I_F = 10 \text{ mA}$ ; see Fig.2  | 0.9  | V             |
|        |                 | $I_F = 100 \text{ mA}$ ; see Fig.2 | 1.1  | V             |
| $I_R$  | reverse current |                                    |      |               |
|        | PZM2.4N         | $V_R = 1 \text{ V}$                | 50   | $\mu\text{A}$ |
|        | PZM2.7N         | $V_R = 1 \text{ V}$                | 20   | $\mu\text{A}$ |
|        | PZM3.0N         | $V_R = 1 \text{ V}$                | 10   | $\mu\text{A}$ |
|        | PZM3.3N         | $V_R = 1 \text{ V}$                | 5    | $\mu\text{A}$ |
|        | PZM3.6N         | $V_R = 1 \text{ V}$                | 5    | $\mu\text{A}$ |
|        | PZM3.9N         | $V_R = 1 \text{ V}$                | 3    | $\mu\text{A}$ |
|        | PZM4.3N         | $V_R = 1 \text{ V}$                | 3    | $\mu\text{A}$ |
|        | PZM4.7N         | $V_R = 1 \text{ V}$                | 3    | $\mu\text{A}$ |
|        | PZM5.1N         | $V_R = 1.5 \text{ V}$              | 3    | $\mu\text{A}$ |
|        | PZM5.6N         | $V_R = 2.5 \text{ V}$              | 2    | $\mu\text{A}$ |
|        | PZM6.2N         | $V_R = 3.0 \text{ V}$              | 2    | $\mu\text{A}$ |
|        | PZM6.8N         | $V_R = 3.5 \text{ V}$              | 2    | $\mu\text{A}$ |
|        | PZM7.5N         | $V_R = 4.0 \text{ V}$              | 1    | $\mu\text{A}$ |
|        | PZM8.2N         | $V_R = 5.0 \text{ V}$              | 700  | nA            |
|        | PZM9.1N         | $V_R = 6.0 \text{ V}$              | 500  | nA            |
|        | PZM10N          | $V_R = 7.0 \text{ V}$              | 200  | nA            |
|        | PZM11N          | $V_R = 8.0 \text{ V}$              | 100  | nA            |
|        | PZM12N          | $V_R = 9.0 \text{ V}$              | 100  | nA            |
|        | PZM13N          | $V_R = 10.0 \text{ V}$             | 100  | nA            |
|        | PZM15N          | $V_R = 11.0 \text{ V}$             | 70   | nA            |
|        | PZM16N          | $V_R = 12.0 \text{ V}$             | 70   | nA            |

## Voltage regulator diodes

## PZM-N series

| SYMBOL | PARAMETER       | CONDITIONS             | MAX. | UNIT |
|--------|-----------------|------------------------|------|------|
| $I_R$  | reverse current |                        |      |      |
|        | PZM18N          | $V_R = 13.0 \text{ V}$ | 70   | nA   |
|        | PZM20N          | $V_R = 15.0 \text{ V}$ | 70   | nA   |
|        | PZM22N          | $V_R = 17.0 \text{ V}$ | 70   | nA   |
|        | PZM24N          | $V_R = 19.0 \text{ V}$ | 70   | nA   |
|        | PZM27N          | $V_R = 21.0 \text{ V}$ | 70   | nA   |
|        | PZM30N          | $V_R = 23.0 \text{ V}$ | 70   | nA   |
|        | PZM33N          | $V_R = 25.0 \text{ V}$ | 70   | nA   |
|        | PZM36N          | $V_R = 27.0 \text{ V}$ | 70   | nA   |
|        | PZM39N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM43N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM47N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM51N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM56N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM62N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM68N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |
|        | PZM75N          | $V_R = 0.7 V_{Znom}$   | 50   | nA   |

## Voltage regulator diodes

## PZM-N series

**Table 1** Per type; PZM2.4N to PZM24N  
 $T_j = 25^\circ\text{C}$  unless otherwise specified.

| PZM<br>-XXX | WORKING VOLTAGE<br>$V_Z$ (V)<br>at $I_Z = 5 \text{ mA}$ ; $t_m = 40 \text{ ms}$ |       |       |       |       |       | DIFFERENTIAL<br>RESISTANCE<br>$r_{\text{dif}}$ ( $\Omega$ ) |       |                      | TEMP.<br>COEFF.<br>$S_Z$ (mV/K)<br>at $I_Z = 5 \text{ mA}$ | DIODE<br>CAP.<br>$C_d$ (pF)<br>at $f = 1 \text{ MHz}$ ;<br>$V_R = 0$ | NON-REPETITIVE<br>PEAK REVERSE<br>CURRENT<br>$I_{ZSM}$ (A)<br>at $t_p = 100 \mu\text{s}$ ;<br>$T_{\text{amb}} = 25^\circ\text{C}$ |
|-------------|---|-------|-------|-------|-------|-------|---|-------|----------------------|--|--|---|
|             | B   |       | B1    |       | B2    |       | B3  |       | $I_Z = 1 \text{ mA}$ |  |  |   |
|             | MIN.  | MAX.  | MIN.  | MAX.  | MIN.  | MAX.  | MIN.  | MAX.  | TYP.                 | MAX.   | TYP.   | MAX.  |
| 2.4N        | 2.30  | 2.60  | —     | —     | —     | —     | —   | —     | 275                  | 400  | 70   | 100   |
| 2.7N        | 2.50  | 2.90  | 2.50  | 2.75  | 2.65  | 2.90  | —   | —     | 300                  | 450  | 75   | 100   |
| 3.0N        | 2.80  | 3.20  | 2.80  | 3.05  | 2.95  | 3.20  | —   | —     | 325                  | 500  | 80   | 95  |
| 3.3N        | 3.10  | 3.50  | 3.10  | 3.35  | 3.25  | 3.50  | —   | —     | 350                  | 500  | 85   | 95  |
| 3.6N        | 3.40  | 3.80  | 3.40  | 3.65  | 3.55  | 3.80  | —   | —     | 375                  | 500  | 85   | 90  |
| 3.9N        | 3.70  | 4.10  | 3.70  | 3.97  | 3.87  | 4.10  | —   | —     | 400                  | 500  | 85   | 90  |
| 4.3N        | 4.01  | 4.48  | 4.01  | 4.21  | 4.15  | 4.34  | 4.28  | 4.48  | 410                  | 600  | 80   | 90  |
| 4.7N        | 4.42  | 4.90  | 4.42  | 4.61  | 4.55  | 4.75  | 4.69  | 4.90  | 425                  | 500  | 50   | 80  |
| 5.1N        | 4.84  | 5.37  | 4.84  | 5.04  | 4.98  | 5.20  | 5.14  | 5.37  | 400                  | 480  | 40   | 60  |
| 5.6N        | 5.31  | 5.92  | 5.31  | 5.55  | 5.49  | 5.73  | 5.67  | 5.92  | 80                   | 400  | 15   | 40  |
| 6.2N        | 5.86  | 6.53  | 5.86  | 6.12  | 6.06  | 6.33  | 6.26  | 6.53  | 40                   | 150  | 6  | 10  |
| 6.8N        | 6.47  | 7.14  | 6.47  | 6.73  | 6.65  | 6.93  | 6.86  | 7.14  | 30                   | 80   | 6  | 15  |
| 7.5N        | 7.06  | 7.84  | 7.06  | 7.36  | 7.28  | 7.60  | 7.52  | 7.84  | 15                   | 80   | 2  | 10  |
| 8.2N        | 7.76  | 8.64  | 7.76  | 8.10  | 8.02  | 8.36  | 8.28  | 8.64  | 20                   | 80   | 2  | 10  |
| 9.1N        | 8.56  | 9.55  | 8.56  | 8.93  | 8.85  | 9.23  | 9.15  | 9.55  | 20                   | 100  | 2  | 10  |
| 10N         | 9.45  | 10.55 | 9.45  | 9.87  | 9.77  | 10.21 | 10.11   | 10.55 | 20                   | 150  | 2  | 10  |
| 11N         | 10.44   | 11.56 | 10.44 | 10.88 | 10.76 | 11.22 | 11.10   | 11.56 | 25                   | 150  | 2  | 10  |
| 12N         | 11.42   | 12.60 | 11.42 | 11.90 | 11.74 | 12.24 | 12.08   | 12.60 | 25                   | 150  | 2  | 10  |
| 13N         | 12.47   | 13.96 | 12.47 | 13.03 | 12.91 | 13.49 | 13.37   | 13.96 | 25                   | 170  | 2  | 10  |
| 15N         | 13.84   | 15.52 | 13.84 | 14.46 | 14.34 | 14.98 | 14.85   | 15.52 | 25                   | 200  | 3  | 15  |
| 16N         | 15.37   | 17.09 | 15.37 | 16.01 | 15.85 | 16.51 | 16.35   | 17.09 | 25                   | 200  | 4  | 20  |
| 18N         | 16.94   | 19.03 | 16.94 | 17.70 | 17.56 | 18.35 | 18.21   | 19.03 | 25                   | 225  | 4  | 20  |
| 20N         | 18.86   | 21.08 | 18.86 | 19.70 | 19.52 | 20.39 | 20.21   | 21.08 | 30                   | 225  | 4  | 20  |
| 22N         | 20.88   | 23.17 | 20.88 | 21.77 | 21.54 | 22.47 | 22.23   | 23.17 | 30                   | 250  | 5  | 25  |
| 24N         | 22.93   | 25.57 | 22.93 | 23.96 | 23.72 | 24.78 | 24.54   | 25.57 | 30                   | 250  | 6  | 30  |

## Voltage regulator diodes

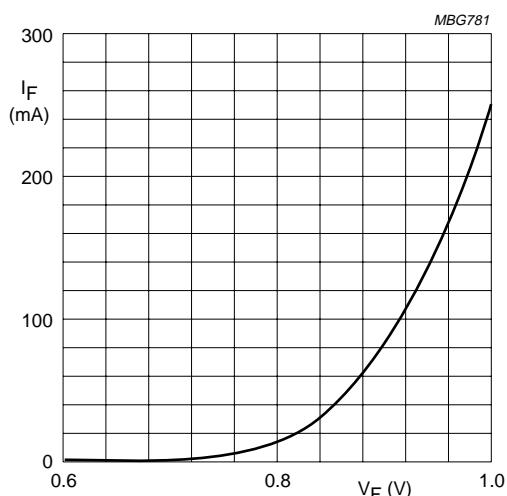
## PZM-N series

| PZM<br>-XXX | WORKING VOLTAGE<br>$V_Z$ (V)<br>at $I_Z = 2$ mA; $t_m = 40$ ms |       |      |      |      |      | DIFFERENTIAL<br>RESISTANCE<br>$r_{dif}$ ( $\Omega$ ) |                |              | TEMP.<br>COEFF.<br>$S_Z$ (mV/K)<br>at<br>$I_Z = 2$ mA | DIODE<br>CAP.<br>$C_d$ (pF)<br>at<br>$f = 1$ MHz;<br>$V_R = 0$ | NON-REPETITIVE<br>PEAK REVERSE<br>CURRENT<br>$I_{ZSM}$ (A)<br>at $t_p = 100$ $\mu$ s;<br>$T_{amb} = 25$ °C |  |
|-------------|--|-------|------|------|------|------|--|----------------|--------------|---|--|--|--|
|             | B  | B1    |      | B2   |      | B3   |  | $I_Z = 0.5$ mA | $I_Z = 2$ mA |   |  |  |  |
|             |  | MIN.  | MAX. | MIN. | MAX. | MIN. | MAX.   |                | MIN.         | MAX.  |  |  |  |
| 27N         | 25.10  | 28.90 | —    | —    | —    | —    | —  | 35             | 250          | 8   | 40   | 23.4   |  |
| 30N         | 28.00  | 32.00 | —    | —    | —    | —    | —  | 35             | 250          | 10  | 40   | 26.6   |  |
| 33N         | 31.00  | 35.00 | —    | —    | —    | —    | —  | 40             | 275          | 11  | 40   | 29.7   |  |
| 36N         | 34.00  | 38.00 | —    | —    | —    | —    | —  | 40             | 300          | 15  | 60   | 33.0   |  |
| 39N         | 37.00  | 41.00 | —    | —    | —    | —    | —  | 40             | 300          | 25  | 75   | 36.4   |  |
| 43N         | 40.00  | 46.00 | —    | —    | —    | —    | —  | 45             | 325          | 30  | 80   | 41.2   |  |
| 47N         | 44.00  | 50.00 | —    | —    | —    | —    | —  | 45             | 325          | 30  | 90   | 46.1   |  |
| 51N         | 48.00  | 54.00 | —    | —    | —    | —    | —  | 45             | 350          | 35  | 110  | 51.0   |  |
| 56N         | 52.00  | 60.00 | —    | —    | —    | —    | —  | 50             | 375          | 40  | 120  | 57.0   |  |
| 62N         | 58.00  | 66.00 | —    | —    | —    | —    | —  | 60             | 400          | 50  | 140  | 64.4   |  |
| 68N         | 64.00  | 72.00 | —    | —    | —    | —    | —  | 75             | 400          | 55  | 160  | 71.7   |  |
| 75N         | 70.00  | 79.00 | —    | —    | —    | —    | —  | 85             | 400          | 70  | 175  | 80.2   |  |
|             |  |       |      |      |      |      |  |                |              | 35  | 35   | 0.20   |  |

## Voltage regulator diodes

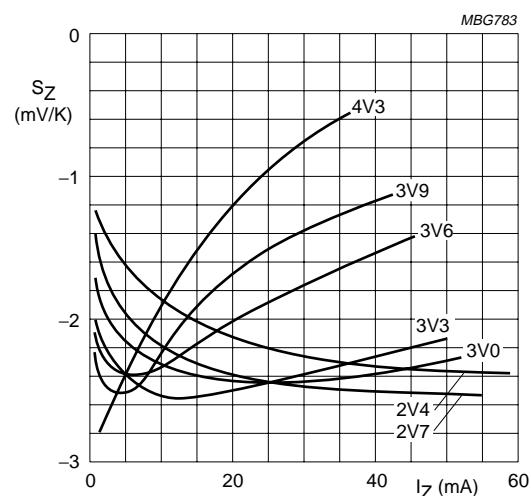
## PZM-N series

## GRAPHICAL DATA



$T_j = 25^\circ\text{C}$ .

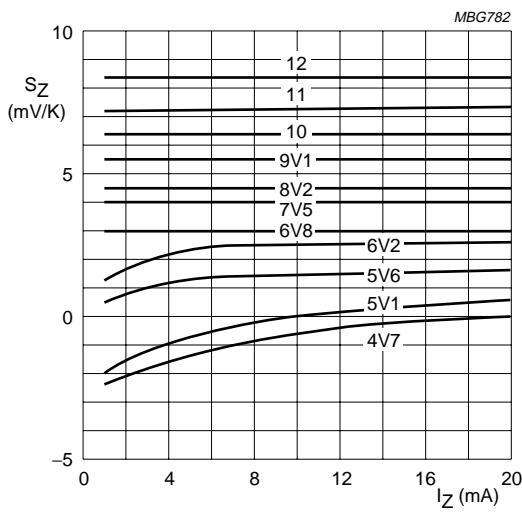
Fig.2 Forward current as a function of forward voltage; typical values.



PZM2.4N to PZM4.3N.

$T_j = 25^\circ\text{C}$  to  $150^\circ\text{C}$ .

Fig.3 Temperature coefficient as a function of working current; typical values.



PZM4.7N to PZM12N.

$T_j = 25^\circ\text{C}$  to  $150^\circ\text{C}$ .

Fig.4 Temperature coefficient as a function of working current; typical values.

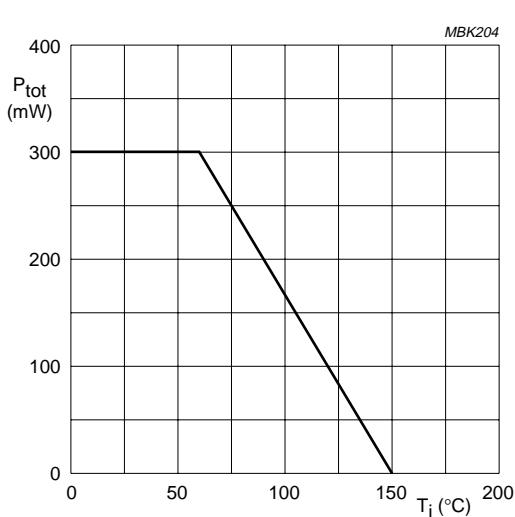


Fig.5 Power derating curve.

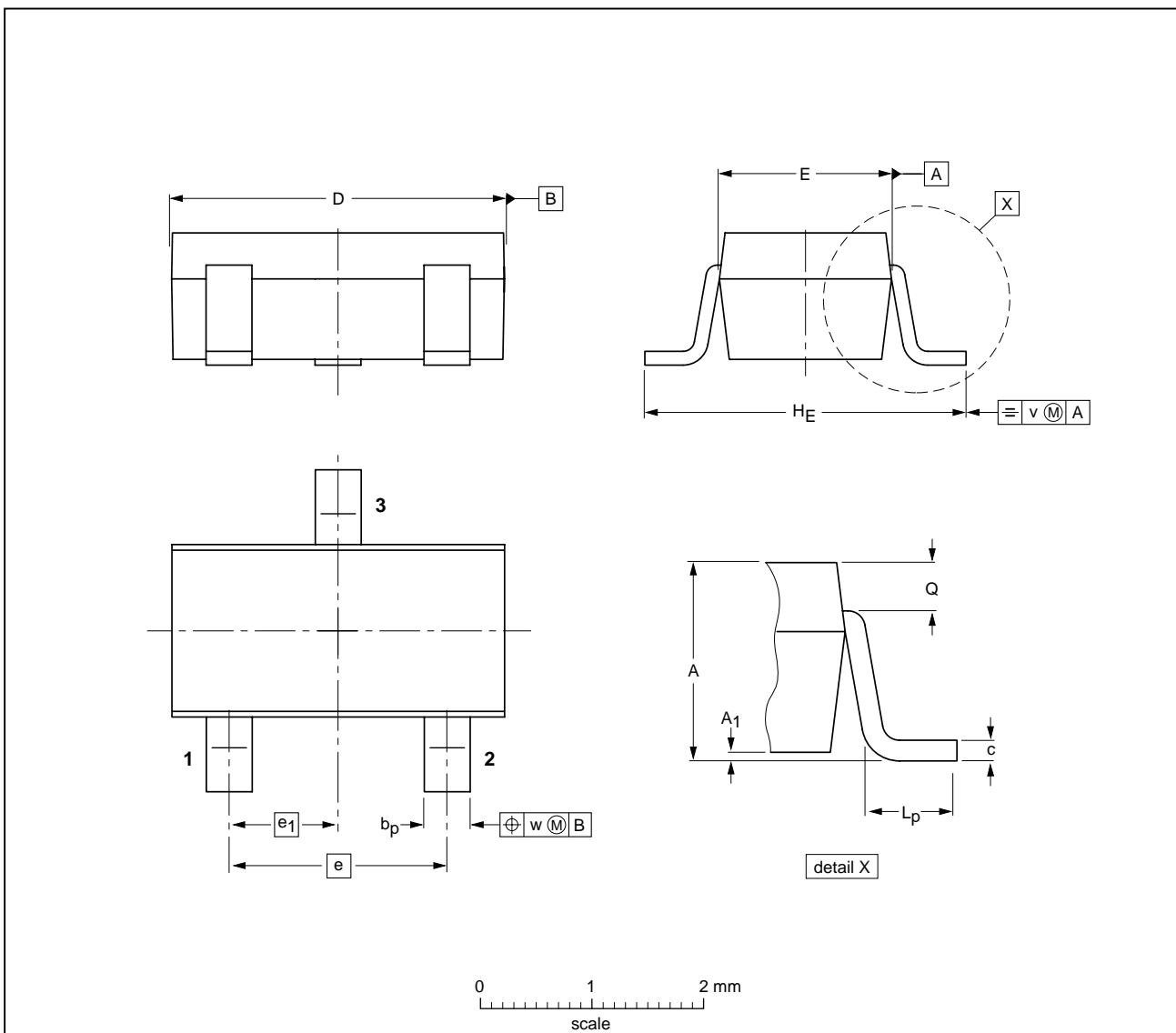
## Voltage regulator diodes

## PZM-N series

## PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT346



## DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub> | b <sub>p</sub> | c            | D          | E          | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | Q            | v   | w   |
|------|------------|----------------|----------------|--------------|------------|------------|-----|----------------|----------------|----------------|--------------|-----|-----|
| mm   | 1.3<br>1.0 | 0.013<br>0.35  | 0.50<br>0.35   | 0.26<br>0.10 | 3.1<br>2.7 | 1.7<br>1.3 | 1.9 | 0.95           | 3.0<br>2.5     | 0.6<br>0.2     | 0.33<br>0.23 | 0.2 | 0.2 |

| OUTLINE VERSION | REFERENCES |        |       |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|------------|
|                 | IEC        | JEDEC  | EIAJ  |  |                     |            |
| SOT346          |            | TO-236 | SC-59 |  |                     | 97-02-28   |

## Voltage regulator diodes

## PZM-N series

**DEFINITIONS**

| <b>Data Sheet Status</b>  |   |
|---|---|
| Objective specification   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification   | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>  |   |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

**LIFE SUPPORT APPLICATIONS**

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

Voltage regulator diodes

PZM-N series

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**NOTES**

Voltage regulator diodes

PZM-N series

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**NOTES**

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